



AMERICAN JOURNAL OF PHARMTECH RESEARCH

Journal home page: <http://www.ajptr.com/>

Anticancer, Antiviral, Antidiabetic, Antifungal and Phytochemical Constituents of Medicinal Plants.

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ABSTRACT

Since immemorial time, utilization of medicinal plants has been in practice by the practitioner to treat variety of ailments without knowing the active bio-compound which lead to the reduction or elimination of symptoms of the disease. Recent advancement in technologies became a turning point in health care setting where many medicinal plants which are gifted from the nature were being employed in research to synthesized variety of phytochemical compounds which were responsible for the various pharmacological properties of the plants. Few compounds which are plant derivative have been patented for the commercial use to treat illness. In this review, medicinal plants related to few pharmacological properties like anticancer, antiviral, antidiabetics, antifungal were reviewed and documented. Also the phytochemical constituents were reviewed and documented. This review proved few related pharmacological properties of the plants where these plants are employed in the folk medicine. Advancement in technologies and also research fundings provide the suitable platform for the researchers to conduct extensive research on the medicinal plants.

Keywords: Anticancer, Antiviral, Antidiabetic, Antiviral, Phytochemical constituents, Medicinal plants.

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Received 31 May 2013, Accepted 18 June 2013

Please cite this article in press as: Manoharan S. *et al.*, Anticancer, Antiviral, Antidiabetic, Antifungal and Phytochemical Constituents of Medicinal Plants..American Journal of PharmTech Research 2013.

INTRODUCTION

In last 5 years, research on more than 13 000 plants have been conducted. A lot of evidence has collected to demonstrate huge potential of the medicinal plants employed in traditional system. In recent years, research on medicinal plants has increased¹

World Health Organization (WHO) define medicinal plants as a herbal preparation which is produced by introducing plant materials into various of process which include extraction, fractionation, purification, concentration, or other physical or biological processes which may be produced for basis for herbal product or for the immediate consumption²

About 80% of people living in rural area of India are depend on medicinal plants. Medicinal herbs are widely employed by greater number of people because seeking for side effect free of treatment since using synthetics drugs can produce side effects. Overall, 80% of the world's population has dependability in traditional medicine, chiefly based on plant drugs for their primary healthcare³

No plant that can be categories as does not has medicinal value. The active constituents are typically extracted from all herbal/ plant structures, but the quantity of these components are vary from structure to structure. Highest quantity of active principle within the part are favored to therapeutic purposes²

Plants are rich in nutrients besides they are the chief source of foodstuff. For antibacterial, antifungal and antiviral activities, worldwide, the extract of herb is used. Medicinal possessions of more than 400,000 species of tropical flowering plants have been acknowledged. Due to this explanations, traditional medicine inexpensive when compare to modern medicine²

Vast number of research articles narrowly focused on the anticancer, antiviral, antidiabetics, antifungal are published. Based on the information extracted from these articles, the review was done to looked into anticancer, antiviral, antidiabetics, antifungal and also the phytochemical constituents that are present in the respective medical plants. Phytochemical constituent are the compound/s that present in the plant where it lead to the pharmacological properties of the plant. 1 compound may have 1 or more than 1 pharmacological properties. Example compound A may have anticancer activity or anticancer and antiviral activities. Different compounds may share same pharmacological property and may not. Example compound A and B may have anticancer activity or compound A has antiviral and compound B has anticancer activity.

Currently researchers are significantly involved in the research related to medicinal plants since

the medicinal plants are having promising pharmacological activities which can be utilized in treating various kind of diseases. Researchers proved the practice of utilizing the medicinal plants for treating the diseases in immemorial time. In this review, medicinal plants related to anticancer, antiviral, antidiabetic, antifungal and its phytochemical that are composed by the medicinal plants were reviewed and documented in this article for the easier searching purpose by the researchers and also by the readers who are interested on medicinal plants.

Table 1-4 listed various medicinal plants with different pharmacological properties.

Table 1: Medicinal plants with anticancer activity

No	Plant name	Family name	Part used	Research focused	Ref.
1	<i>Andrographis paniculata</i>	Acanthaceae	Leaves	Hepato cellular, Human colorectal	[1]
2	<i>Psidium guajava</i>	Myrtacea	Branch	Human colon	[4]
3	<i>Ocimum sanctum</i>	Lamiaceae	Leaves	Cervical	[5]
4	<i>Azadirachta indica</i>	Meliaceae.	Leaves	Cervical	[5]
5	<i>Withania somnifera</i>	Solanaceae	Roots	Cervical	[5]
			Leaves	Breast, Lung, Ovary cancer cell line	[6]
6	<i>Acalypha indica</i>	Euphorbiaceae	Aerial parts	Epidermoid carcinoma of oral cavity, breast adenocarcinoma, small cell lung carcinoma	[7]
7	<i>Allium sativum</i>	Liliaceae	Bulb	Human liver	[8]
8	<i>Agave americana</i>	Agavaceae	Leaves	Human cell line of ovarian teratocarcinoma	[9]
9	<i>Aloe vera</i>	Liliaceae	Leaves	Ehrlich Ascites Carcinoma cell	[10]
10	<i>Piper betle</i>	Piperaceae	Leaves	Human breast cancer cell line	[11]
11	<i>Saraca Indica</i>	Caesalpinacea	Leaves	Ehrlich ascites carcinoma	[12]
12	<i>Abrus precatorius</i>	Fabaceae	Seeds	Ehrlich ascitis carcinoma	[13]
13	<i>Annona squamosa</i>	Annonaceae	Seeds	AK-5 tumor	[14]
14	<i>Bacopa monnieri</i>	Scrophulariaceae	Aerial parts	Ehrlich Ascites Carcinoma	[15]
15	<i>Bauhinia racemosa</i>	Caesalpinaceae	Stem	Ehrlich ascites carcinoma	[16]
16	<i>Curcuma amda</i>	Zingiberaceae	Whole plant	Ehrlich ascites carcinoma	[17]
17	<i>Cleome viscosa</i>	Capparaceae	Bark	Ehrlich ascites carcinoma	[18]
18	<i>Calotropis procera</i>	Asclepiadaecae	Roots	Hep2 cell	[19]
19	<i>Zingiber officinale</i>	Zingiberaceae	Leaves, Rhizomes	Human breast carcinoma cell	[20]
20	<i>Calotropis gigantea</i>	Asclepiadaceae	Flower	Ehrlich ascites carcinoma cells	[21]
21	<i>Terminalia chebula</i>	Combretaceae	Fruit pericarp	Colo205, Hop62, HT29, SiHa, MIA-PA-CA-2, DWD, T24, PC3, A549, ZR-75-1, A2780, DU145, MCF7, K562	[22]
22	<i>Acorus calamus</i>	Araceae	Rhizome	Colo205, Hop62, HT29, SiHa, MIA-PA-CA-2, DWD, T24, PC3, A549, ZR-75-1, A2780, DU145, MCF7, K562	[22]

23	<i>Bauhinia variegata</i>	Caesalpiniaceae	Stem bark	Colo205, Hop62, HT29, SiHa, MIA-PA-CA-2, DWD, T24, PC3, A549, ZR-75-1, A2780, DU145, MCF7, K562) [22]
24	<i>Phyllanthus amarus</i>	Euphorbiaceae	Whole plant	Colo205, Hop62, HT29, SiHa, MIA-PA-CA-2, DWD, T24, PC3, A549, ZR-75-1, A2780, DU145, MCF7, K562 [22]
25	<i>Glycyrrhiza glabra</i>	Fabaceae	Root	Colo205, Hop62, HT29, SiHa, MIA-PA-CA-2, DWD, T24, PC3, A549, ZR-75-1, A2780, DU145, MCF7, K562 [22]

Colo205 (Colon), Hop62 (Lung), HT29 (Colon), SiHa (Cervix), MIA-PA-CA-2 (Pancreas), DWD (Oral), T24 (Bladder), PC3 (Prostate), A549 (Lung), ZR-75-1 (Breast), A2780 (Ovary), DU145 (Prostate), MCF7 (Breast), K562 (Leukemia)

Table 2: Medicinal plants with antiviral activity

No	Plant name	Family	Part used	MIC value: Extraction solvent: Virus type
1	<i>Calotropis gigantea</i>	Asclepiadaceae	Leaves	0.002-0.1 mg/ml: Ethanol: HSV-1 (Herpes Simplex type-1) and HSV(Vesicular Stomatitis Virus)
2	<i>Costus speciosus</i>	Zingiberaceae	Leaves	0.002-0.1 mg/ml: Ethanol: HSV-1 and HSV
3	<i>Eugenia michelii</i>	Myrtaceae	Leaves	0.002-0.1 mg/ml: Ethanol: HSV-1 and HSV
4	<i>Andrographis paniculata</i>	Acanthaceae	Aerial part	Methanolic: Dengue Virus Serotype 1
5	<i>Mentha arvensis</i>	Labiatae	Leaves	0.002-0.1 mg/ml: Ethanol: HSV-1 and HSV
6	<i>Orthosiphon aristatus</i>	Labiatae	Leaves	0.002-0.1 mg/ml: Ethanol: HSV-1 and HSV
7	<i>Polygonum minus</i>	Polygonaceae	Leaves	0.002-0.1 mg/ml: Ethanol: HSV-1 and HSV
8	<i>Ricinus communis</i>	Euphorbiaceae	Leaves	0.002-0.1 mg/ml: Ethanol: HSV-1 and HSV
9	<i>Alternanthera sessilis</i>	Amaranthaceae	Leaves	0.001-0.1 mg/ml: Ethanol: HSV-1
10	<i>Momordica charantia</i>		Fruits	Methanolic: Dengue Virus Serotype 1
11	<i>Eleusine indica</i>	Gramineae	Leaves	0.001-0.1 mg/ml: Ethanol: HSV-1
12	<i>Euphorbia hirta</i>	Euphorbiaceae	Leaves	0.001-0.1 mg/ml: Ethanol: HSV-1
13	<i>Morus alba</i>	Moraceae	Root bark	HSV- 1
14	<i>Leea indica</i>	Leeaceae	Leaves	0.001-0.1 mg/ml: Ethanol: HSV-1
15	<i>Aristolochia bracteolate</i>	Aristolochiaceae	Fruits	Newcastle disease virus (NDV), Fowlpox virus (PV)
16	<i>Acalypha indica</i>	Euphorbiaceae	Leaves	0.005-0.1 mg/m: Ethanol: HSV
17	<i>Pongamia pinnata</i>	Papillionaceae	Seed	Aqueous: HSV-1, HSV-2
18	<i>Cerbera manghas</i>	Apocynaceae	Fruits	0.005-0.1 mg/ml: Ethanol: HSV

19	<i>Codiaeum variegatum</i>	Euphorbiaceae	Leaves	0.005-0.1 mg/ml: Ethanol: HSV
20	<i>Plectranthus amboinicus</i>	Labiatae	Leaves	0.005-0.1 mg/ml: Ethanol: HSV
21	<i>Centella asiatica</i>	Umbelliferae	Leaves	0.005-0.1 mg/ml: Ethanol: HSV
22	<i>Mirabilis jalapa</i>	Nyctaginaceae	Leaves	0.005-0.1 mg/ml: Ethanol: HSV
23	<i>Morinda elliptica</i>	Rubiaceae	Leaves	0.005-0.1 mg/ml: Ethanol: HSV
24	<i>Oenanthe javanica</i>	Umbelliferae	Leaves	0.005-0.1 mg/ml: Ethanol: HSV
25	<i>Piper sarmentosum</i>	Piperaceae	Leaves	0.005-0.1 mg/ml: Ethanol: HSV

1, 2, 3, 5, 6, 7, 8, 9, 11, 12, 13, 14, 16, 18, 19, 20, 21, 22, 23, 24, 25 were obtained from²³. 4, 10 were obtained from²⁴, 13, 15, 17 were obtained from^{25, 26, 27}.

Table 3: Medicinal plants with antidiabetic activity

No	Plant name	Family name	Part used	References
1	<i>Andrographis paniculata</i>	Acanthaceae	Aerial part	[28]
2	<i>Psidium guajava</i>	Myrtaceae	Leaves	[29]
3	<i>Ocimum sanctum</i>	Labiatae	Seed	[30]
4	<i>Azadirachta indica</i>	Meliaceae	Leaves	[31]
5	<i>Withania somnifera</i>	Solanaceae	Root, leaves	[32]
6	<i>Acalypha indica</i>	Euphorbiaceae	whole plants	[33]
7	<i>Allium sativum</i>	Liliaceae	Bulb	[34]
8	<i>Morus alba</i>	Moraceae	Leaves	[35]
9	<i>Aloe vera</i>	Liliaceae	Leaves	[36]
10	<i>Piper betle</i>	Piperaceae	Leaves	[37]
11	<i>Tinospora cordifolia</i>	Menispermaceae	Stem	[38]
12	<i>Abrus precatorius</i>	Fabaceae	Seeds	[39]
13	<i>Annona squamosa</i>	Annonaceae	Leaves	[40]
14	<i>Mimosa pudica</i>	Mimisaceae	Leaves	[41]
15	<i>Bauhinia racemosa</i>	Caesalpineaceae	Leaves	[42]
16	<i>Curcuma amada</i>	Zingiberaceae	Rhizomes	[43]
17	<i>Dodonaea viscosa</i>	Sapindaceae	Aerial parts	[44]
18	<i>Calotropis procera</i>	Asclepiadaceae	Leaves	[45]
19	<i>Murraya koenigii</i>	Rutaceae	Fruits	[46]
20	<i>Emblica officinalis</i>	Euphorbiaceae	Fruits	[47]
21	<i>Terminalia chebula</i>	Combretaceae	Fruits	[48]
22	<i>Sesbania sesban</i>	Fabaceae	Leaves	[49]
23	<i>Bauhinia variegata</i>	Caesalpinaceae	Leaves	[50]
24	<i>Phyllanthus amarus</i>	Euphorbiaceae	Leaves	[51]
25	<i>Hibiscus rosa sinensis</i>	Malvaceae	Leaves	[52]

Table 4: Medicinal plants with antifungal activity

No	Plant name	Family name	Part used	Fungal strains	Ref
1	<i>Andrographis paniculata</i>	Acanthaceae	Leaves, Stems	<i>Candida albicans</i> , <i>Aspergillus flavus</i>	[53]
2	<i>Psidium guajava</i>	Myrtaceae	Leaves	<i>Aspergillus sp</i>	[54]
3	<i>Ocimum sanctum</i>	Labiatae	Leaves	<i>Aspergillus fumigatus</i> , <i>Aspergillus niger</i>	[55]
4	<i>Azadirachta indica</i>	Meliaceae	Leaves	<i>Aspergillus fumigatus</i> , <i>Aspergillus niger</i>	[55]
5	<i>Withania somnifera</i>	Solanaceae	Root	<i>Candida albicans</i>	[56]

6	<i>Acalypha indica</i>	Euphorbiaceae	Leaves	<i>Candida albican</i>	[57]
7	<i>Allium sativum</i>	Liliaceae	Bulb	<i>Trichophyton rubrum</i>	[58]
8	<i>Morus alba</i>	Moraceae	Leaves	<i>Candida albicans, Aspergillus niger</i>	[59]
9	<i>Aloe vera</i>	Liliaceae	Leaves	<i>Aspergillus flavus and Aspergillus niger</i>	[60]
10	<i>Piper betle</i>	Piperaceae	Leaves	<i>Candida albicans, Saccharomyces cerevisiae</i>	[61]
11	<i>Tinospora cordifolia</i>	Menispermaceae	Stem	<i>Aspergillus niger, Aspergillus fumigates, Mucor sp, Penicillium sp</i>	[62]
12	<i>Abrus precatorius</i>	Fabaceae	Stem, bark	<i>Candida albicans</i>	[63]
13	<i>Annona squamosa</i>	Annonaceae	Root Leaves Seeds	<i>Trichophyton rubrum, Aspergillus niger, Aspergillus flavus, Candida albicans</i>	[64]
14	<i>Mimosa pudica</i>	Mimosae	Leaves	<i>Aspergillus flavus, Trycophyton ruburum</i>	[65]
15	<i>Bauhinia racemosa</i>	Caesalpineaceae	Bark	<i>Aspergillus niger, Candida albicans</i>	[66]
16	<i>Curcuma longa</i>	Zingiberaceae	Rhizome	<i>Aspergillus niger, Candida Albicans</i>	[67]
17	<i>Dodonaea viscosa</i>	Sapindaceae	Leaves, Shoots	<i>Aspergillus niger, Aspergillus flavus, Paecilomyces varioti, Microsporium gypseum, Trichophyton rubrum</i>	[68]
18	<i>Calotropis procera</i>	Asclepiadaceae	Roots	<i>Epidermophyton Flocosum, Trichophyton gypseum</i>	[69]
19	<i>Murraya koenigii</i>	Rutaceae	Leaves	<i>Asperigillus niger, Candida albicans</i>	[70]
20	<i>Emblica officinalis</i>	Euphorbiaceae	Fruits	<i>Aspergillus niger, Candida albicans</i>	[71]
21	<i>Terminalia chebula</i>	Combretaceae	Leaves	<i>Aspergillus flavus, Aspergillus niger, Alternaria brassicicola, Alternaria alternate, Helminthosporium tetramera</i>	[72]
22	<i>Sesbania sesban</i>	Fabaceae	Leaves, Stem Root	<i>Aspergillus fumigatus, Colletotrichum gloeosporioides, Curvularia lunata, Fusarium oxysporum, Verticillium glaucum</i>	[73]
23	<i>Bauhinia variegata</i>	Caesalpinaceae	Leaves Bark Flower	<i>Candida albicans 5, Aspergillus niger, Penicillium chrysogenum, Phaenorochoete chrysosporium, Candida albicans ATCC 10231, Ralstonia entropha</i>	[74]
24	<i>Phyllanthus amarus</i>	Euphorbiaceae	Stem bark	<i>Aspengellus flavus, Candidas albican</i>	[75]
25	<i>Lawsonia inermis</i>	Lythraceae	Leaves	<i>Aspergillus niger</i>	[76]

PHYTOCHEMICAL CONSTITUENTS OF THE MEDICINAL PLANTS

1. *Andrographis paniculata*: Andrographolide, Neoandrographolide, flavonoids (7-O-methylwogonin, apigenin, onysilin and 3,4-dicaffeoylquinic acid)^{77, 78, 24}
2. *Psidium guajava*: Flavonoid- particularly Quercetin (leaves)⁷⁹
3. *Ocimum sanctum*: Eugenol (1-hydroxy-2-methoxy-4-allylbenzene)⁸⁰
4. *Azadirachta indica*: Nimbidin (antifungal, hypoglycemic), Polysaccharides GIa, GIb (antitumour), Cyclic trisulphide, cyclic tetrasulphide (antifungal)⁸¹
5. *Withania somnifera*: Isopelletierine, anaferine, withanolides, Withaferins, sitoindoside VII and VIII, sitoindoside IX and X⁸²
6. *Acalypha indica*: Alkaloids, Catachols, Flavonoids, Phenolic compounds, Saponins, Steroids (isolated from leaves and root)⁸³
7. *Allium sativum*: Allicin⁷⁷
8. *Agave Americana*: Carbohydrates, Reducing sugar, Steroids, Cardiac glycosides, Saponin glycosides (preliminary studies from various extract of root)⁸⁴
9. *Aloe vera*: Acemannan (polysaccharide), emodin, lectins (anticancer)⁸⁵
10. *Piper betle*: Eugenol, α -tocopherol, hydroxychavicol, β -carotene, ursolic acid (cancer preventative agents)⁸⁶
11. *Saraca Indica*: Quercetin, Quercetin-3-o-alpha-1-rhamnoside, kaempferol-3-o-alpha-L-rhamnoside, ceryl alcohol, beta-sitosterol (found in leaves and stem)⁸⁷
12. *Abrus precatorius*: Saponins, Tannins, Triterpenes, Alkaloids, Flavonoids, Glycosides (from different crude extracts)⁶³
13. *Annona squamosal*: Glycoside, alkaloids, saponins, flavonoids, tannins, carbohydrates, proteins, phenolic compounds, phytosterols, amino acids .The various chemical constituents isolated from leaves, stems and roots of the plant including anonaine, aporphine, coryline, isocorydine, norcorydine, glaucine⁸⁸
14. *Bacopa monnieri*: Saponins, flavonoids, tannins, triterpenoids (hydroethanolic extract)⁸⁹
15. *Bauhinia racemosa*: Carbohydrates, Glycosides, Alkaloids, Phytosterol, Fixed oils and fats, Saponins, Phenolic compounds, tannins, Flavanoids (preliminary studies using methanol and aqueous extract)⁹⁰
16. *Curcuma amada*: Difurocumenonol, amadannulen (highly antioxidant and antimicrobial)⁹¹
17. *Cleome viscosa*: Umbeliferone derivatives, designated as cleosandrin, series of coumarino-lignins (cleomiscosins) from the seeds and new glycoside eriodictyol- 5-rhamnoside (whole plant)⁹²

18. *Calotropis procera*: Cardenolide, proceragenin (plant), benzoylelinesolone, benzoylelisolinellone (root bark), calotropin, calotropagenin (leaves, stalk), calotropenyl acetate, multiflavenol (flower), uzarigenin, terpenol ester (latex)⁹³
19. *Curcuma longa*: Curcumin, curcuminoids, α -turmerone, Camphor, β -turmerone^{85, 94}
20. *Calotropis gigantea*: di-(2-ethylhexyl) phthalate (antitumour- from flower) Flavonoids, triterpenoids, alkaloids, steroids, glycosides, saponins, terpenes, enzymes, alcohol, resin, fatty acids and esters of calotropeols, volatile long chain fatty acids, glycosides and proteases (from various part)^{21, 95}
21. *Terminalia chebula*: Gallic acid, 1,2,3,4,6-penta-O-galloyl- D-glucopyranose, chebulagic acid, and chebulinic acid (methanol extract inhibit cancer cell growth)⁹⁶
22. *Acorus calamus*: α and β - asarone (antioxidant, antilipidemic, antimicrobial, anticancer, immunosuppressive, antidiabetes)⁹⁷
23. *Bauhinia variegata*: Cyanidin glucoside, malvidin glucoside, peonidin glucoside, kaempferol galactoside⁹⁸
24. *Phyllanthus amarus*: Phyllanthin (antibacterial), lignans, glycosides, flavonoids, alkaloids, ellagitannins, phenylpropanoids, common lipid, sterols, flavonols⁹⁹
25. *Glycyrrhiza glabra*: Flavonoids, licochalcone-A, triterpenoid saponins, glycyrrhizic acid, coumarin, triterpene sterol, liquiritoside⁸⁵
26. *Embllica officinalis*: Ellagic acid, gallic acid, quercetin, kaempferol, emblicanin, flavonoids, glycosides, proanthocyanidins⁸⁵
27. *Costus speciosus*: Costunolide and eremanthin (antifungal)¹⁰⁰
28. *Eugenia michelii* synonym: *Eugenia uniflora*: Phenol, triterpenes, tannins, glycosides and flavonoids¹⁰¹
29. *Mentha arvensis*: Catechic tannins, flavones, flavonols, xantones, flavonols, flavonones and steroids¹⁰²
30. *Orthosiphon aristatus*: Neoorthosiphols A and B (isolated from water decoction), flavones¹⁰³
31. *Polygonum minus*: Flavone: 6, 7-methylenedioxy- 5,3',4',5' tetramethoxyflavone; Methyl flavonol: 6,7-4',5'-dimethylenedioxy-3,5,3'-trimethoxyflavone (from ether extract)¹⁰⁴
32. *Ricinus communis*: Ricin A (antitumour), gallic acid, quercetin, gentisic acid, rutin, epicatechin, ellagic acid (antioxidant)¹⁰⁵
33. *Alternanthera sessilis*: Sterols (isolated from chloroform extract-responsible for wound healing)¹⁰⁶
34. *Momordica charantia*: Luteolin, kampherol, quercetin²⁴

35. *Eleusine indica*: Schaftoside (6-C-beta-glucopyranosyl-8-C-alpha-arabinopyranosylapigenin), vitexin (8-C-beta-glucopyranosylapigenin) (isolated from aerial part)¹⁰⁷
36. *Euphorbia hirta*: Flavonoids: Euphorbianin, leucocyanidol, camphol, quercitrin and quercitol; Polyphenols: Gallic acid, myricitrin, 3,4-di-O-galloylquinic acid, 2,4,6-tri-O-galloyl-D-glucose, 1,2,3,4,6-penta-O-galloyl-β-D-glucose; Tannins: Euphorbins A, B, C, D, E; Triterpenes and phytosterols: β-Amyrin, 24-methylenecycloartenol, and β-Sitosterol; Alkanes: Heptacosane, n-nonacosane¹⁰⁸
37. *Leea indica*: β-sitosterol, lupeol, ursolic acid, gallic acid, n-Octadecane, palmitic acid, n-Eicosane, n-Tricosane, Farnesol, n-Tetracosane, n-Tetratetracontane, Solanesol, Phthalic acid, 17-Pentatriacontene, n-Heptacosane, n-Tetratriacontane, 1-Eicosanol, n-Tritetracontane, Lycopersin, n-Heptadecane, di-n-Butyl phthalate, Butyl-2-ethylhexyl phthalate, Isooctyl phthalate¹⁰⁹
38. *Aristolochia bracteolata*: Ceryl alcohol, β-sitosterol and aristolochic acid (leaves, fruit) alkaloid, myristic, palmitic, stearic, lignoceric, oleic and aristolochic acid (seeds) aristolochic acid (roots)¹¹⁰
39. *Morus alba*: Moralbanone, kuwanon S, mulberroside C, cyclomorusin, eudraflavone B hydroperoxide, oxydihydromorusin, leachianone G, α-acetyl-amyrin (isolated from root bark for the antiviral activity)²⁵
40. *Pongamia pinnata*: Amentoflavone, kaempferol (flavonoids- anti-inflammatory, ulcer protective) steroids, flavonoids, saponins, alkaloids, glycosides¹¹¹
41. *Cerbera manghas*: Cerbinal, neriifolin¹¹²
42. *Codiaeum variegatum*: Flavanoids and tannins¹¹³
43. *Plectranthus amboinicus*: Carbohydrates, reducing sugars, alkaloids, sterols, glycosides, phenolics, tannins, flavonoids and amino acids¹¹⁴
44. *Centella asiatica*: Alkaloids, glycosides, terpenoids, steroids, flavonoids, tannins, reducing sugars¹¹⁵
45. *Mirabilis jalapa*: Alkaloids, flavonoids, phenols, glycosides, tannins, saponins and lignin¹¹⁶
46. *Morinda elliptica*: Anthraquinones (nordamnacanthal, alizarin-1-methyl ether, rubiadin, soranjidiol, lucidin-ω-methyl ether, morindone)¹¹⁷
47. *Oenanthe javanica*: Sesquiterpenes¹¹⁸
48. *Piper sarmentosum*: Amide: 3-(3',4',5'-trimethoxyphenylpropanoyl) pyrrolidine, 3-(4'-methoxyphenylpropanoyl) pyrrole, N-(3-phenylpropanoyl) pyrrole; Sterol: β-sitosterol¹¹⁹
49. *Tinospora cordifolia*: Berberine, tinosporine, giloin, giloinin (stem, bark)⁸⁵

50. *Mimosa pudica*: Mimosine (5 α amino 3 hydroxy 4 oxo 1 H (H) pyridine propionic acid), α -spinasterol, Phenyl ethylamine derivatives¹²⁰
51. *Dodonaea viscosa*: Aliarin, dodonic acid, viscosol stigmosterol, isorhamnetin, penduletin, quercetin, doviscogenin, dodonosides A and B¹²¹
52. *Murraya koenigii*: Alkaloids, flavonoids, steroids, saponines, tannins, triterpenoids¹²²
53. *Sesbania sesban*: Triterpenoids, carbohydrates, vitamins, amino acids, proteins, tannins, Saponins glycosides, steroids (preliminary studies) cyanidin and delphinidin glucosides (flower) alpha-ketoglutaric, oxaloacetic, pyruvic acids (Pollen and pollen tubes) oleanolic acid, stigmasta-5, 24(28)-diene-3-ol-3-0- β -D-galactopyranoside, fatty acids and amino acids; Various types of lignins: guaiacyl, syringyl, P-hydroxyphenylpropane building units, antitumor principal kaempferol disaccharide¹²³
54. *Hibiscus rosa sinensis*: 2,3-hexanediol, n-Hexadecanoic acid, 1,2-Benzenedicarboxylic acid, squalene (flower extract)¹²⁴
55. *Lawsonia inermis*: Lawsonsone (2-hydroxy- 1,4- naphthoquinone, CAS 83-72-7)¹²⁵
56. *Zingiber officinale*: Quercetin (flavonoids) (anticancer)²⁰

CONCLUSION

Vast number of researches had been conducted on medicinal plants. Medicinal plants with many active compounds present are basically to protect itself from any threats from its external environment. These compounds are extracted out and pharmacological activities were carried out. Anticancer, antiviral, antidiabetic, antifungal and phytochemical constituents of the plants are reviewed. Many researchers have proved the effectiveness of medicinal plants which are used in folk medicine. Modern research focused on these medicinal plants employing standard scientific methods to carried out the pharmacological properties of the plants and recent advancement in technologies give opportunities to many researchers to carried out extensive research on medicinal plants and few patents on the valuable medicinal plants has been documented. This patents are important so that it can be beneficial to the public for curing related diseases.

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